



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/082,010	02/22/2002	Rajiv K. Singh	5853-224	1904

7590 04/09/2008  
Gregory A. Nelson, Esq.  
Akerman, Senterfitt & Eidson, P.A.  
222 Lakeview Avenue, Suite 400  
P.O. Box 3188  
West Palm Beach, FL 33402-3188

EXAMINER
----------

ANGADI, MAKI A

ART UNIT	PAPER NUMBER
----------	--------------

1792

MAIL DATE	DELIVERY MODE
-----------	---------------

04/09/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/082,010.

Applicant(s)

SINGH ET AL.

Examiner

MAKI A. ANGADI

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 29 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-6, 8-10, 17, 19-26, 29, 32-35, 37 and 72-74 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-10, 17, 19-26, 29, 20, 32-35, 37 and 72-74 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Due to the fact that the last office action was never received by the applicant, the period for response is restarted with the mailing of this office action.

#### **Claim Objections**

1. Claim objections for claims 23 and 24 have been withdrawn after the amendments

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-3, 5, 6, 9, 10, 19-2-3, 31-34, 36-37, and 73-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garg (US 6,048,577) in view of Meyer et al. (US 5,055,019) and further in view of Kaufman (US 6,309,560 B1 ).

Garg teaches nano-sized powder of alpha alumina having silica coating thereon (column 5, lines 7-10). Garg further teaches a polishing slurry is comprised of a alumina powder has a silica coating wherein 95% of the particles have widths of from 20 to about 50 nanometers while less than 5% have particle sizes greater than 100 nanometers and is dispersed in a liquid dispersion medium (claims 6 and 9).

The aforementioned reads on: A slurry for chemical mechanical polishing (CMP), comprising: a bulk solution; and a plurality of particles, in claim 1; and encompasses an average particle size of said nanosize comprising particles is less than 500 nm, in claim 9 and is from 200 to 500 nm, in claim 10.

In claims 1, 5, 6, 9 and 73 Garg differs in failing to teach a plurality of nanoporous comprising particles. However, Meyer discloses boehmitic alumina compounds having  $\text{Al}_2\text{O}_3$  and the compounds have pore radii in the range of 3 to 100 nm (Abstract and column 1, lines 6-10), which reads on a plurality of nanoporous comprising particles. Since Meyer illustrates a plurality of nanoporous comprises particles is known, then it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Garg's slurry by employing compounds having a pore radii in the nm range as

taught by Meyer, including applicants' specifically claimed range because such compounds can be used in polishing agents (Meyer, column 1, lines 11-16).

Garg in view of Meyer differ in failing to teach at least one additive selected for the group consisting of an oxidizer, a selective adsorption additive, and a salt, in claim 1; wherein said additive comprises said selective adsorption additive, in claim 2; at least one passivating additive, in claim 19; at least one complexing agent, as specified in claims 20-21; wherein said selective adsorption additive comprises a mixture of at least one anionic surfactant and at least one cationic or zwitterionic surfactant, in claim 22; wherein said selective adsorption additive comprises at least one surfactant selected from the group consisting of SAS, SDS, CTAB. And CTAC octylphenol ethylene oxide condensate polyoxyethylene sorbitan monooleate, and a water soluble copolymer of an average molecular weight of approximately 15,000 consisting of  $\alpha$ -olefins and dicarboxylic acids, partially esterified with an ethoxylated alcohol, in claim 23; at least one salt, in claims 31-32; pH 1 to 6, in claim 72; pH 1 to 6 or 8-13, in claim 73; and pH 6-13 and 8-11, respectively, in claims 33 and 34; and at least one oxidizer, in claims 36-37.

Kaufman teaches chemical mechanical polishing slurry (CMP slurry) that comprises an oxidizer, an abrasive, a complexing agent, a film forming agent (same as Applicants' passivating additive) and other optional ingredients (column 2, lines 24-28). Well known polishing slurry additives may be incorporated into a cmp slurry. Optional and useful additives include salts (column 6, line 63 -

Art Unit: 1792

column 7, line 5); anionic, cationic, nonionic, or amphoteric surfactant, which preferably include dodecyl sulfate sodium salt, sodium lauryl sulfate, dodecylsulfate ammonium salt, and mixtures thereof (column 7, lines 8-42). Kaufman also teaches the slurry is maintained at pH within a range of 2.0 to about 12.0 (column 9, lines 1-5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Garg in view of Meyer by employing an oxidizer, and additives such as salts and surfactants, as taught by Kaufman for the purpose of respectively aiding in oxidizing and polishing metals (Kaufman, column 5, lines 39-51), improving or enhancing the polishing rate of barrier layers in the wafers (Kaufman, column 6, line 65 -column 7, line 2), and reducing the within-wafer-in-uniformity of the wafers, thereby improving the surface of the wafer and reducing wafer defects (Kaufman, column 7, lines 15-19).

It is noted that Garg in view of Meyer fails to teach a condition wherein said selective adsorption is in a concentration of from 6 to 1,000 critical micelle concentration (CMC) when said selective adsorption is non-ionic and from 1 to 1000 CMC when said selective adsorption additive is zwitterionic, anionic or cationic, said selective adsorption additive self assembling in said bulk solution, in claim 3.

Kaufman illustrates CMP slurries comprising anionic, cationic, nonionic, or amphoteric surfactant are known and surfactants should be present in the slurry in an amount ranging from about 0.001% to about 0.2 % by weight (column

7, lines 10-14 and 29-33). Since the combination of the polishing components as taught by Garg in view of Meyer along with Kaufman's surfactant results in Applicants' specifically claimed composition, then using the combined components in the same manner as claimed by Applicants would result the same wherein said selective adsorption is in a concentration of from 6 to 1,000 critical micelle concentration (CMC) when said selective adsorption is non-ionic and from 1 to 1000 CMC when said selective adsorption additive is zwitterionic, anionic or cationic, said selective adsorption additive self assembling in said bulk solution. Hence, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Garg in view of Meyer by employing Kaufman's surfactant for the purpose of reducing the within-wafer-in-uniformity of the wafers, thereby improving the surface of the wafer and reducing wafer defects (Kaufman, column 7, lines 15-19).

While it is noted that Garg in view of Meyer fail to teach wherein a minimum concentration of said surfactant is 6 CMC, in claim 4.

However, Kaufman illustrates CMP slurries comprising a surfactant are known. As a result, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Garg in view of Meyer by selecting any critical micelle concentration in the Kaufman reference that would effectively accomplish the disclosed composition by conducting routine experimentation, in the absence of unexpected result.

***Claim Rejections - 35 USC § 103***

2. Claims 17 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garg (US '577) in view of Meyer (US'019) as applied to claim 1 above.

Garg in view of Meyer differs in failing to teach the slurry wherein a porosity of said nanoporous particles is in a range from 10 to 60%, in claim 17; and wherein a concentration of said composite particles in said slurry is from approximately 1% to 40% by weight, in claim 35.

However, Garg in view of Meyer illustrates the specific combination of bulk solution and nanoporous particles and nano-sized alpha alumina particles having a coating is known. As a result, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any porosity of the nanoporous particles and weight percent of the alumina coated silica particles (same as applicants' composite particles) in the Garg reference that would effectively accomplish the disclosed composition because it has been held that there is no invention where the difference in proportions is not critical and was ascertained by routine experimentation because the determination of workable ranges is not considered inventive. See *In re Swain and Adams*, 70 USPQ 412 (CPA 1946).

***Claim Rejections - 35 USC § 103***

3. Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg (US '577) in view of Meyer (US '019) as applied to claim 1 above, and further in view of Li et al. (US 6,458,017 B1).



Garg in view of Meyer differ in failing to teach the slurry comprises at least one species selected from the group consisting of a polyhalide ion,  $\text{I}_2$ ,  $\text{BF}_2$ , and  $\text{F}_2$ , in claim 8. Li teaches and illustrates suspension media comprising  $\text{IBr}_2$  and  $\text{BrF}_3$  (column 9, lines 12-14) along with a nanometer size particle (column 3, lines 26-27) is known. Hence it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Garg in view of Meyer by adding known additives as taught by Li to a polishing solution that would effectively accomplish the disclosed composition.

#### ***Claim Rejections - 35 USC § 103***

4. Claims 29 and 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg (US '577) in view of Meyer (US '019) as applied to claim 1 above, and further in view of Sahota et al. (US 6,503,418 B2).

Garg in view of Meyer differs in failing to teach wherein said selective additive comprises at least one polymer, in claim 29; and wherein said polymer is at least on selected from the group consisting of polyethylene oxide (PEO), polyacrylic acid (PAAP), polyacryamide (PAM), polyvinylalcohol (PVA) and polyalkylamine (PAH), in claim 30.

Sahota teaches organic additive such as PVA and PAA, which suppresses formation of precipitates during cmp of copper metal layer (Abstract and column 4, lines 37-47 and claim 1). It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Garg

in view of Meyer by using a polymer additives as taught by Sahota for the purpose of suppressing formation of precipitates during CMP of copper metal layer (Sahota, column 4, lines 37-47).

***Claim Rejections - 35 USC § 103***

5. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garg (US '577) in view of Meyer et al. (US '019) and further in view of Kaufman (US '560 B1) as applied to claims 1-6, 8-10, 17, and 19-23 above, and further in view of Miller (US 6,787,061 B1).

Garg in view of Meyer and Kaufman differs in failing to teach wherein said selective adsorption additive comprises CTAB or CTAC, and said first solid material comprises silica.

Miller discloses, "Slurries for use in the chemical mechanical polishing (CMP) of copper and copper diffusion barriers that reduce pattern sensitive erosion of an underlying dielectric layer include at least one surfactant. Inclusion of surfactants, such as cetyltrimethylammonium bromide in a slurry mixture can reduce pattern sensitive erosion of dielectric materials such as silicon oxide,..." (column 3, lines 14-24). Miller also teaches the surfactant may be dodecyltrimethylammonium bromide (same as Applicants' C12TAB) and cetyltrimethylammonium chloride (column 5, lines 1-12).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Garg in view of Meyer and Kaufman by using a surfactant (selective adsorption additive) such as CTAB for the purpose of reducing erosion of underlying dielectric materials such as silicon oxide (Miller, column 3, lines 18-24)

### ***Response to Arguments***

6. Applicant's arguments filed 1/29/2007 have been fully considered but they are not persuasive.

With respect to claims 1-3, 8-10, 17, 20-26, 29, 30 and 32-35, 37 and 72-73, applicants' arguments on pages 9-10 of the reply asserting that there is no sufficient motivation to combine references of Greg, Meyers and Kaufman are not convincing. Meyers discloses boehmitic alumina compounds having  $Al_2O_3$  and the compounds have pore radii in the range 3-100 nm (col.1, lines 6-10) and the motivation to combine the two is provided on page 3 of the above office action. Kaufman teaches CMP slurry composition that includes an oxidizer, an abrasive, a complexing agent (col.2, lines 24-28). Kaufman provides the necessary motivation by improving the surface of the wafer and reducing wafer defects (col.7, lines 15-19).

Applicants' arguments on page of 15 of the reply asserting that the reference of Garg is not an analogous art are not convincing. The reference of Garg discloses the role of nanoparticle size abrasive particles in the composition as defined in applicants' claims 1, 5, 9 and 10. Further, the motivation to modify

Art Unit: 1792

Garg to add nanoporosity disclosed in Meyer is discussed on page 7-8 of the above office action. The reference of Kaufman provides the necessary motivation to combine, Garg, Meyers by adding different additives such as anionic, cationic, nonionic, surfactants to reduce the within-wafer-non-uniformity of the wafers thereby improving the surface of the wafer and reducing wafer defects.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MAKI A. ANGADI whose telephone number is (571)272-8213. The examiner can normally be reached on 8 AM to 4.30 PM.

Art Unit: 1792

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. A. A./  
Examiner, Art Unit 1792

/Nadine G Norton/  
Supervisory Patent Examiner, Art Unit 1765